[0016] According to the above capacitive sensor, the substrate has flexibility and uses a surface of the first substrate as the contacting surface with the detecting target.

[0017] Therefore, in the above construction, when the capacitive sensor is used as fingerprint sensor, the first substrate is deformed in response to the unevenness of the fingerprint of the finger, the detecting target, and the pressure distribution can be detected accurately.

[0018] In addition, in the capacitive sensor, the area of the horizontal wiring line for noise detection is equal to the detecting area, the area of one horizontal wiring subtracted by the area, at which the vertical wiring lines and the horizontal wiring lines overlap in a horizontal wiring.

[0019] In the above capacitive sensor, the area of the horizontal wiring line for noise detection is set to the detecting area, the area of one horizontal wiring subtracted by the area, at which the vertical wiring lines and the horizontal wiring lines overlap in a horizontal wiring.

[0020] Therefore, when the capacitive sensor is used as a fingerprint sensor, regardless of the change in the unevenness of the first substrate (film substrate) by the fingerprint when the finger comes in contact with the sensor unit, the capacitance between the finger and the horizontal wiring lines is almost equal to the capacitance between the finger and the horizontal wiring line for noise detection, and the amount of noises delivered from the finger to the horizontal wiring lines is almost equal to the amount of noises delivered from the finger to the horizontal wiring line for noise detection. As a result, the difference between the amount of noises delivered to each of the horizontal wiring lines and the amount of noises delivered to the horizontal wiring line for noise detection can be taken by signal processing of the detecting unit of the subsequent stage, thereby the noises delivered from a human body can be easily removed.

[0021] In addition, according to the pressure-sensitive capacitive sensor, the horizontal wiring line for noise detection has the same form as that of the horizontal wiring lines, and a shield plate for shielding the noise is disposed on the horizontal wiring line for noise detection, and the shield plate is disposed in the first substrate while having an opening for opening the area corresponding to the detecting area of the horizontal wiring line for noise detection.

[0022] In the above capacitive sensor, the horizontal wiring line for noise detection is shaped like the horizontal wiring lines on the second substrate, and the shield plate for shielding noises are disposed with the vertical wiring lines in the first substrate. In addition, the shield plate has an opening, through which the area corresponding to the detecting area of the horizontal wiring line for noise detection is exposed.

[0023] Therefore, according to the above structure, a wiring width limit (design rule) of the horizontal wiring line for noise detection can be equal to that of the horizontal wiring (detecting wiring) or the vertical wiring (driving wiring), thereby the cost limit can be reduced.

[0024] In addition, in the above pressure-sensitive capacitive sensor, the shield plate on the horizontal wiring lines for noise is shaped like a comb having the same pitch as those of the vertical. wiring lines in order to be shaped like the shape of the area where the horizontal wiring and the vertical wiring do not cross each other in the matrix of the horizontal wiring and the vertical wiring, and the area corresponding to the detecting area of the horizontal wiring line for noise detection is exposed.

[0025] in the above capacitive sensor, the shield plate on the horizontal wiring lines for noise is shaped like a comb having the same pitch as those of the vertical wiring lines in order to be shaped like the shape of the area where the horizontal wiring and the vertical wiring do not cross each other in the matrix of the horizontal wiring and the vertical wiring, and the area corresponding to the detecting area of the horizontal wiring line for noise detection is exposed.

[0026] Therefore, according to the above structure, since the horizontal wiring line for noise detection is shaped very similar to each horizontal wiring, the manner of unevenness of the second substrate (film substrate) near the area of the sensor unit in contact with the finger becomes equal to the manner of unevenness of the other areas when the capacitive sensor is used as a fingerprint sensor, thereby the amount of noises delivered to the horizontal wiring lines (detecting wiring) is closer to the amount of noises delivered to the horizontal wiring line for noise detection, and thus the noise-reducing effect can be improved by the signal processing of the detecting unit. In addition, a discomfort can be removed when the sensor unit is pressed by the finger.

[0027] Furthermore, in the above capacitive sensor, the first and second substrates are composed of a single flexible film substrate, and the horizontal and vertical wiring lines are formed on the flexible film substrate. In addition, the flexible film substrate is bent at a predetermined position to make the horizontal wiring lines and the vertical wiring lines cross each other.

[0028] Therefore, according to the above structure, the capacitive sensor can be easily assembled, and the manufacturing cost can be reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] **FIG. 1** is a circuit view illustrating an electric structure of a pressure-sensitive capacitive sensor according to the present invention;

[0030] **FIG. 2** is a cross-sectional view of the pressure-sensitive capacitive sensor of **FIG. 1**;

[0031] **FIG. 3** is a view for explaining a usage state of scanning a fingerprint by means of the pressure-sensitive capacitive sensor shown in **FIG. 1**;

[0032] **FIG. 4** is a view illustrating states of a vertical wiring and a horizontal wiring of the pressure-sensitive capacitive sensor shown in **FIG. 1**, a change in capacitance between the vertical wiring and the horizontal wiring when a sensor unit is pressed by a finger, and a change in capacitance between the finger and the horizontal wiring;

[0033] **FIG. 5** is a plan view and a cross-sectional view illustrating a structure of the pressure-sensitive capacitive sensor according to a first embodiment of the invention;

[0034] **FIG. 6** is a plan view and a cross-sectional view illustrating a structure of the pressure-sensitive capacitive sensor according to a second embodiment of the invention;

[0035] **FIG. 7** is a plan view and a cross-sectional view illustrating a structure of the pressure-sensitive capacitive sensor according to a third embodiment of the invention;